



Sensory Garden in Special Schools: The issues, design and use

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Abstract

This study investigates the design and use of sensory gardens in two special schools by evaluating their zones and how they are utilised, especially by children with special needs, and the staff who care for them. Preliminary site studies were undertaken in fourteen sensory gardens around the UK, followed by more detailed data collection at two case-study sites. The aim was to find out the features and issues that are common in sensory gardens. The data collection included interviews, behavioural observation, which was used in conjunction with affordance theory. Drawing on Moore and Cosco's approach (2007), the findings from the data analysis discuss the researcher's main findings: The layout of the circulation network enables user behaviour and use of area, have the highest number of users; and users spent a longer time in zones where sensory, rather than aesthetic values were emphasised. A subset of design recommendations had been produced that will be applicable to across all (or most) sensory gardens.

Keywords: *Aesthetics, affordance, design, pathway, sensory, sensory garden, use.*

Introduction

The term 'sensory garden'¹ in a therapeutic context usually refers to a small garden that has been specially designed to fulfil the needs of a group of people who want to be involved in active gardening and who also enjoy the passive pleasures of being outdoors amongst plants (Gaskell, 1994). Shoemaker (2002:195) stated that '*sensory gardens cannot be designed without considering the human element. Unlike traditional display gardens that are meant to be observed from a distance, sensory*

gardens draw the visitor into touch, smell and actively experience the garden with all senses'. Lambe (1995:114) also differentiated sensory gardens from any other garden by her statement, '*The only difference in a sensory garden is that all these components, (hand landscaping, soft landscaping, colours, textures and wildlife) must be carefully chosen and designed to appeal to the senses in such a way that they provide maximum sensory stimulation*'.

The attitude of having sensory garden for people with mobility or impairment issues was reflected in the early design

and construction, which were focused on too few sensory experiences. In an interview that the researcher conducted with Jane Stoneham (August 9th, 2006), who is the director of the Sensory Trust² and the author of the book, *'Landscape Design for the Elderly and Disabled People'*, Stoneham stated that the initial idea of sensory gardens derived from the horticultural therapy movement, which developed in the United Kingdom in the 1970s. Horticultural therapy was focused on special environments, i.e. hospitals and rehabilitation units and as a result, developed more rapidly than sensory gardens. One positive aspect of sensory gardens was the genuine response to meet the needs of visually-impaired people. However, there was not really much thought given to the design of these gardens. The first sensory gardens were often located in public parks because the local authority would have decided that it was a way of showing that they were implementing inclusion strategies. However, the reality was that they were small areas, often signposted as 'Garden for the Blind', and they consisted of a combination of scented plants, Braille labels and raised planters.

Over time, society's attitude to disability changed, as did the function and users of the sensory garden. Any design for disabled people³ should aim to help overcome the stigma that is attached to being labelled 'disabled'. Since the mid-1970s, a rapidly growing body of opinion has suggested that this can be achieved more easily by integrating, rather than segregating facilities. Rowson (1985:21) cited that in 1978, the then United Kingdom Minister for the Disabled, Alfred Morris said, *'The simplest way of*

causing a riot in any locality in Britain would be to clamp on the able-bodied the same restrictions that now apply to the disabled. They feel that their personal handicaps are bad enough without the gratuitous social handicap of being treated differently from everyone else'.

Stoneham (2006) added that in the 1980s, visually impaired people challenged the initial ideas about 'gardens for the blind' because the issue of being segregated from able-bodied people was itself beginning to be challenged. It is now widely understood that disabled people do not want to be segregated from able-bodied people in their enjoyment of green space (Thoday and Stoneham, 1996; O'Connell and Spurgeon, 1996).

The initial study

The topic 'sensory garden' raised a number of preliminary questions for the researcher: *Are not all gardens sensory? What is a sensory garden composed of? How do people use or benefit from sensory gardens?* During the early stage of the study, the researcher undertook an essential review of the literature to find out how best to approach the topic of 'sensory gardens'. This initial study was undertaken to ascertain what body of knowledge there was on the subject and to help to identify keywords for various searches. However, the review showed that there had been a lack of rigorous research on the subject, it identified a research gap and research questions could not be identified. It was decided that the best approach would be to conduct preliminary site studies, mainly by visiting places that claimed to have

sensory gardens and by carrying out personal observations of the use of these gardens and by conducting individual interviews with teachers, therapists and key expert, in order to refine the research direction.

There were three main issues that arose from the preliminary site studies.

1. It seems very clear that sensory gardens which are designed as such, tend not to be entirely satisfactory from the users' perspective, as designers, apparently, may not interview the users before designing the sensory gardens. At present, designers think they are designing sensory gardens well but their biggest mistake is in presuming that they know what the needs of users are. For example:

- i) Water is an important feature in that it provides users with the opportunity to respond to it in terms of hearing and touch it but in some sensory gardens, this feature is not fully accessible, therefore, the feature is not of true benefit to the users (see Image 1).



Image 1: An inaccessible water feature in a sensory garden.

While water was mentioned as an important feature in a sensory garden, owing to its benefits in learning and therapy, some sensory gardens seem to lack this element (see Image 2).



Image 2: A sensory garden that lacks a water feature.

- ii) Loose materials on the surface of paths, such as gravel separated by wood edging, are inaccessible to wheelchair users, therefore, such users are unable to appreciate significant features that can only be assessed in this way⁴ (see Image 3).



Image 3: An inaccessible path to significant features in a sensory garden.

iii) Ramps, even with an accessible gradient, were not appreciated by the staff of the schools, as they were concerned about the slippery surface. Steps were also not favoured; especially by wheelchair users and their carers (see Image 4)



Image 4: Steps like this are common in a sensory garden. As a result, wheelchair users are not able to access some parts of the garden.

2. Regardless of who designs a sensory garden, a designer or via community or school effort, challenges in terms of long-term maintenance should also be addressed in the design plan. If they are not, a poorly maintained sensory garden will not benefit its users and it will lack aesthetic value (see Image 5).

3. In the interview that the researcher conducted with Stoneham (2006), she stated that to date, there had been no rigorous research done on the topic of sensory gardens. She added that a considerable amount of research needed to be conducted in the area of sensory impairment, mainly with regard to discovering what people with special needs really need. She warned that a great



Image 5: An example of what a sensory garden can look like if it is not well maintained.

number of assumptions have been made about how disabled people navigate and benefit from an outdoor environment but that this had not yet been fully tested. She claimed that this is evident in the fact that an ambiguous direction has been taken in relation to sensory gardens in the field of landscape architecture and that there are no design guidelines for sensory gardens (although there are some publications on anthropometrics for a variety of users, including disabled people). Hence, the design of sensory gardens currently relies on the experience and attitude of designers. This idea is supported by designers, Petrow (2006), Mathias (2006), Robinson (2007) and Boothroyd (2007), who note that there is a lack of detailed guidelines available when designing for sensory gardens.

The aim and objectives

During an interview with Kath Jefferies (February, 16th 2007), who is a retired deputy head teacher of the Lyndale School, she mentioned that: *'Every*

special school has slightly different needs. The sensory garden will reflect those needs so no sensory garden will be the same. They might have similar elements but there will always be an emphasis upon the needs of their individual children'. Following on from Jefferies' statement, the aim was to find out the common features and issues that are likely to be common to all sensory gardens. Specifically, the research would:

- i. Observe and record how users responded to and engaged with the features in the sensory garden;
- ii. Investigate the design process and intentions of the designer;
- iii. Investigate the teachers and therapists' thoughts and experiences with reference to the benefits and problems in having the sensory garden;
- iv. Assess opportunities for users' activity in the sensory garden.

The methodology

Due to the limitations of time for research and the difficulties surrounding communication between the researcher and the children with special needs, particularly those with a speech, language and communication difficulties, the following methods were thought to be the most appropriate:

- Individual interviews using walk-through. *'Individual interviews using walk-through is when the designer walks through the completed design and comments on the experience he*

or she has had and intended users are likely to have in various areas of the project' (Bechtel and Srivastava, 1978:442).

- Observation and behaviour mapping. *'Behavioural observation is a commonly used time-sampling technique. At pre-arranged times, an observer codes the activities and locations of all the people in a space'* (Friedman, et al., 1978:203).

A theory studied in conjunction with these methods was affordance. *'Affordance is the perceived functional significance of an object, event or place for an individual'* (Heft, 2001:123). Many methods in conducting qualitative research with children with special needs have been used in the context of case study.

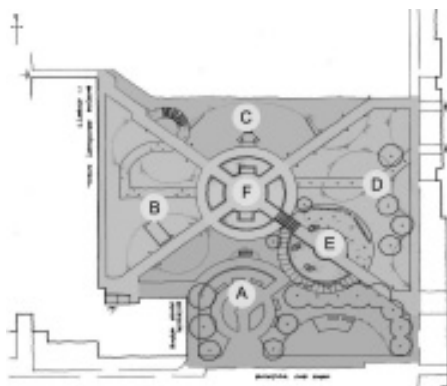
Based on the interviews with the key expert, designers, teachers and therapists during the preliminary site studies, the researcher noted nine design aspects that might enable the use of area in the sensory garden, namely, accessibility, aesthetic⁵ value, maintenance, planting, quality of sensory equipment, quantity of sensory equipment, quality of surfacing (hard and soft), safety and spatial location of the garden in relation to buildings and context. These design aspects will be used in the interviews at the later data collection stage. After conducting the interviews, personal observation notes were recorded while undertaking the behavioural observation. This was to support the study with a few noted incidents that the researcher translated as anecdotal evidence. A selection of photographs⁶ was chosen to illustrate these noteworthy incidents.

CASE STUDY 1: Royal School for the Deaf and Communication Disorders, Cheshire (RSDCD)

It was a sunny day and there was a light wind. A group of students with multiple disabilities were ready for the literacy session with their teacher and a few teaching assistants. This weekly session with the students was used to reinforce what they were feeling, smelling, hearing or seeing, in terms of the different sounds and textures offered in the sensory garden. As they were leaving their classroom, they chanted and repeated together, 'We are going out to the garden'. 'Eileen', who wore leg braces, looked pretty with her pink hair band. She showed excitement on her face by nodding, while 'Hamzah', who was in his wheelchair, clapped his hands while looking up at his teacher. The rest of the literacy session continued in some of the zones in the sensory garden (see Images 6, 8, 10, 11)

The RSDCD is a residential, co-educational, non-maintained special school and college. The school hours are from 9am until 3pm, Mondays to Fridays. The students' disabilities range from severe and complex learning difficulties, autism, emotional and behavioural difficulties, multi-sensory impairment, to medical, physical and language disorders. The age range is from two to twenty years. The sensory garden, called the Multi Sensory Millennium Maze (see Plan 1), was designed in 2000 by Sue Robinson, a landscape architect from Stockport Metropolitan Borough Council. It is situated in the middle of the school, between two buildings. It is a square form: a courtyard with flat

topography. The school has an in-house gardener who provides continuous maintenance.



Plan 1: Plan of the Sensory Garden at the RSDCD.

Zone A: Parents' Waiting Area (see Image 6)



Image 6: *Parents' Waiting Area* (zone A). Sited at the entrance to the sensory maze and it utilises an underused fringe area with seating and a textured wall. It is easily accessible from the car park and main building entrance. The zone covers 660sq. metres.

As a group of teachers, and students with multiple disabilities turned left out of the patio doors, they reached out to

touch the textured wall. The teachers supported the students in doing this, chanting the appropriate words as they explored the wall, 'Fence panel, fence panel... bamboo, bamboo...trellis, trellis... little sticks, little sticks... brush, brush... thick bamboo, thick bamboo...' The students began to anticipate the sequence of the texture of these features.

Zone B: Exploraway (see Image 7)



Image 7: *Exploraway* (zone B). This zone offers more difficult challenges in terms of the change in levels, together with the larger surface textures of loose stone. The zone covers 511 sq. metres.

The group of students and teachers undertaking the literacy session did not use this zone because its surface was unsuitable for wheelchair users. However, in a preliminary interview the researcher conducted with Anne Gough (July 21st, 2006), who is a teacher of children with multi-sensory impairments up to age 16, she used the trail with 'Jo', who has poor sight. 'Jo' found her way around the sensory garden very well, using the scent of lavender and, when she smelt it, it reminded her of her mother at home, who had also had it planted in her garden. According to Kaplan (1976),

when users encounter familiar features, this may encourage easy way finding.

Zone C: Green Space One (see Image 8)



Image 8: *Green Space One* (zone C). Includes a willow tunnel with a bark chip surface, a lawn, seating, scented plants, lighting bollards and a vaporised trail⁷. This zone covers 316 sq. metres.

The students moved over to the willow tunnel. 'Where are we, Hamzah?' the teacher asked. They went through the tunnel slowly to give the students time to respond to the experience of slight coolness from the shadows. 'Willow, willow all around...willow, willow all around...', chanted the teachers, while wheeling their students through the willow tunnel. Then they stopped in the middle of the tunnel and played with the artwork display. They touched and felt the artwork. Some hit and heard the sound of rattling decorative cans.

Zone D: Green Space Two (see Image 9)

One of the standard multi-sensory curriculum item, which is used by teachers in all special schools, is PECS⁸



Image 9: *Green Space Two* (zone D). Includes a lawn patches, trees, hedges, lighting bollards, pathways and a rubber walk. This zone covers 370 sq. metres.

(Picture Exchange Communication System), which involves showing photographs and finding objects in the sensory garden using touch, hearing, smell and sight. This exercise is beneficial for way finding and identifying significant features in the sensory garden.

Zone E: Asteroid Arts Garden (see Image 10)

The teachers stamped their feet over the boardwalk together and chanted, 'Bump,

bump, bump over the decking... bump, bump, bump over the decking...' 'Eileen', who was wearing leg braces, copied what her teacher did. The vibration on the boardwalk stimulated Steve, who is visually impaired. Then they moved round to the sand and gravel area to explore these textures while singing, 'Sand between my fingers...sand between my fingers...gritty gravel, gritty gravel...big rocks, big rocks...' The teachers laughed as 'Hamzah', who was in his wheelchair, put his face on the surface of the boulders.

Zone F: Water Central Area (see Image 11)

'Underneath the pergola, underneath the pergola...', the teachers sang. Everyone grouped around the fountain to hear the water. They chanted in a whisper, 'Can you hear the water trickling? Can you hear the water trickling?' Some students jumped in their wheelchair while making loud, shrill noises, showing their excitement! The teachers helped the students to feel the water from the



Image 10: *Asteroid Arts Garden* (zone E). Open space with gravel and wood edge, boardwalk, musical instruments, balancing beam, rock sculpture, lighting bollards, shrubs and pathways. This zone covers 231 sq. metres.

fountain by stepping over the shrubs which were planted around the water feature and scooped the water with their hands and whispered again, 'Feel the cool, cool water... feel the cool, cool water...' and they sprinkled some water onto the students' faces and hands. The students' positive behaviours included licking the water with their hands and then reaching out for more.

All of them then moved as a group to the picnic table where there was some food to taste. 'Snacks at the picnic table,

snacks at the picnic table...' After having their snacks, the teachers said, 'We have finished' and they signed to their students. 'Do you know our way back to the classroom?' the teacher asked 'Eileen'. Amazingly, she began to take the lead and, through the use of plants, followed the path back to her classroom's patio. Using sign language, the teacher smiled and patted Eileen's shoulder, 'Well done, Eileen'.

CASE STUDY 2: Lyndale School, Wirral (LS)

A large group of teachers wheeled their students with multiple disabilities out from their classroom to the Rainbow Walk (see Image 11). A teacher wanted to conduct their speech therapy session there. The morning weather was fine with sunny spells and the wind was blowing in between the leaves. 'Do you know where we are going, David?' asked a teacher. 'David' jumped in his wheelchair while his hands grasped the armrest. He was making a loud sound, showing anticipation. As the large group reached the area, they formed a circle around the conifer tree. The rest of the literacy session continued at the Rainbow Walk (see Image 12).

LS is a non-residential special school. The school hours are from 9am until 3pm, Mondays to Fridays and it caters for children with complex needs, and profound and multiple disabilities from the ages of two to eleven years. The inspiration for having a sensory garden (see Plan 2) came from the school's Deputy Head, Dave Jones, who died in summer 2002. In January 2003, the



Image 11: *Water Central Area (zone F).* This zone has a focal area with water feature that offers a contrasting texture between the soft water and the rough 'pineapple' surface. There is a pergola with climbers linked to the central space garden as well as raised planters with seating and easy access to herbs and scented plants. This zone covers 230 sq. metres.

planning and design work started and was completed in September 2005. A landscape architect from Groundwork Wirral, Mark Boothroyd, designed the sensory garden. It is situated between the school's building and the residential backyard. It has a linear form with a combination of flat and undulating topography. The school relies on volunteer efforts for the garden's maintenance. The project relied on extensive local community fundraising and was phased to overcome difficulties in programming works and budgets.

Zone A: Rainbow Walk (see Image 12)

As the teachers and students gathered in pairs around the conifer tree, with a plank as the floor surface, the teachers sang, 'Here we go 'round the mulberry bush'. As they chanted, the researcher thought it was a perfect song to sing as it invited many physical movements that generated sound and vibration for the students, such as stamping, jumping, skipping, clapping and cheering. The

students responded positively by swinging their hands while turning their heads from one side to another. Some students opened their mouths and tried to mimic their teachers.

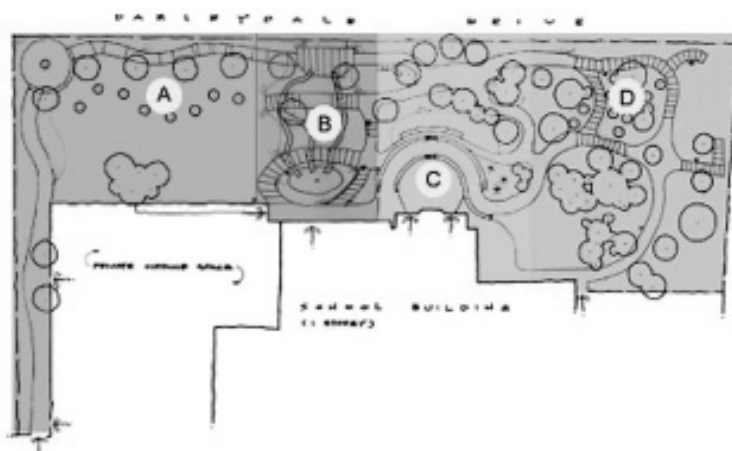
Zone B: Water Garden (see Image 13)

Zone C: Green Space (see Image 14)

Zone D: Woodland Garden (see Image 15)

Results of the interviews

The respective designers of the RSDCD and LS sensory gardens agreed that various design aspects: accessibility, maintenance, planting, the quality of the surfacing (hard and soft), safety, the spatial location of the garden in relation to site context and aesthetic values, all enable the use of area in a sensory garden. However, the teachers and therapists in both special schools had no strong views on aesthetic values in relation to the use



Plan 2: Plan of the sensory garden at the LS.



Image 12: *Rainbow Walk* (zone A). The *Rainbow Walk* surface offers different colours and textures, which provide a broad learning experience. It includes a kickabout area with lawn and trees that provide shade. The zone covers 767 sq. metres.



of area in the sensory garden because they have to work with some students who are partially sighted or visually impaired. This finding is also consistent with the literature on user preference, particularly of children's for outdoor spaces, which

suggests that the value of a place is not determined by its appearance or aesthetic qualities but by its physical properties and the different activities that they offered (Gibson, 1979; Whitehouse et al., 2001).



Image 13: *Water Garden* (zone B). It includes a pond with marginal plants, an interactive fountain with talking tubes and slate stone channels. It acts as a visual and focal area in the sensory garden. Low wooden handrails were used and kept to a minimum so that users can have close contact with the water feature using boardwalks and bridges. It also comprises rough, loose stones that can be moved around to divert the direction of the water channels. This allows close engagement with the environment. The zone covers 223 sq. metres.



Image 14: *Green Space* (zone C). It consists of a covered tunnel, seating, a sloping lawn, musical pipes, a textured wall as well as raised beds with herbs and scented plants. Environmental art and willow weaving add richness of the area. The zone covers 337 sq. metres.

Results of the behavioural observation

This analysis correlated the total area of the sensory garden with the frequencies of users, the main activities⁹ and the seated¹⁰ activity. The results signified that there are factors that influenced the pattern of use as follows:

- i. The users' activities in the sensory garden were dependent neither on the size of the zone nor the number of features but rather the functionality of the features that were available.
- ii. The results also suggest that the number of features and the total area did not correlate with the median length of time spent there per user.
- iii. The time spent is not significantly different by gender in the sensory garden in both schools.
- iv. Correlations with the number of users and the time they spent sitting in the zones better related to the functionality of the features than to the total area or the availability of seating. In other words, users used areas where they sit in, rather than

seats to sit on. Therefore, the focus on seated activity is an equal concern with moving because students with special needs sit in different features than the staff.



Image 15: *Woodland Garden* (zone D). Also known as the sound garden or the sound trail. It integrates an artwork display, a boardwalk with rope railing and a variety of sound stimuli. Lush and rich woodland planting provide texture, sound and scent as well as inviting wildlife. A strong contrasting area of dark and shade offers experiences that are different from other areas. This zone covers 556 sq. metres.

Results of the actualised affordances¹¹

This part of analysis investigated the features with which users' engaged the most or least, and the properties of the sensory garden that afforded users the greatest opportunity to undertake a variety of activities. Staff and students' activities in both special schools allowed these users to identify that the sensory gardens afforded them more benefits than disadvantages. The results also showed that both sensory gardens offered more positive¹² affordances than negative¹³ ones. The attributes of the sensory gardens that enabled user engagement with the features and a variety of activities in the sensory garden were:

- i. A good circulation network from the school building to the sensory garden.
- ii. A variety of features placed adjacent to the pathway, which afforded easy way finding in the sensory garden back to the school building.
- iii. An appropriate gradient and hard surface material for a range of users, including wheelchair users and students on specially-adapted bicycles.
- iv. Lush, rich flora and fauna, creating natural environments for ecological and sensory learning.

Results of the actualised affordances in relation to the landscape design categories

The final stage of analysis categorised the actualised affordances in relation to the

landscape design categories¹⁴: senses (touch, taste, smell, sound, sight); physical (mobility) and social skills (speech). The analysis examined 'sensory function' based on observations of how users engage their senses to receive, interpret and, consequently, to behave in relation to the features in the case-study sensory gardens.

The results showed that users responded to both sensory gardens' affordances as the following values:

- i. The sense of touch had the highest frequencies compared to the other senses. This reflects Olds' view (2001:231) that *'touch is the most important sense for young children'*. She added that, feeling through textures enhanced tactile stimulation among children with special needs, thus developing their form and space perception of being in the outdoor environment.
- ii. Soft landscape, hard landscape and landscape furniture were important features, which helped to stimulate their senses and encourage physical activities as well as social skills.
- iii. Users appeared to feel an attraction to and affection for the sensory garden as their educational outdoor area. This was reflected in their behaviour changes, such as feeling fascinated while engaging with familiar features or feeling a sense of fear (Ulrich, 1993) and trying to escape from being in contact with animals or plants, which they think have negative threats in the garden.

Discussion

Findings related to the research questions are discussed as follows:

1 Based on the behavioural observation, how do the users respond to the features of the sensory garden and how is that reflected in their behaviour?

The study focused on observing the pattern of use and how an environment enables the uses that can occur within it. In the use of area in both case-study sensory gardens, it is clear that wherever there is access, the students will undertake a variety of activities and engage more with the features compared to the staff. This contributed to the finding that the number of features, the number of activities undertaken and the time spent engaged in that activity by the users was not dependent on the total area of the zone nor did it relate to the median time spent there per user but rather what did enable the usage was the functioning of the features and access to them.

2. Are sensory gardens being used in the way that is being claimed by the designers? The study explored the potential for users' engagement with the features by recording three affordances:

Actualised and potential affordances. Actualised affordances let designers know the opportunities with which users engage, while potential affordances are those which seem to be offered in a sensory garden. For example, in the RSDCD, students in wheelchairs wanted to play with the musical instruments but did not manage to because the surface material made that impossible. Designers

need to think of the design of a sensory garden as requiring further refinement once it is in use to ensure that users are fully able to realise all actual and potential affordances.

Unique and multiple affordances. A sensory garden feature that affords more than one experience is potentially of greater value than a feature that offers only one affordance because it provides a range of affordances and a richer experience for the users. Designers will want to consider the full range of affordances so that they know the value and use of the gardens, such that are likely to enhance users' sensory, physical and social capabilities.

Positive and negative affordances. Designers should not assume that every experience is positive and this study has differentiated pleasant from unpleasant by observing and recording users' experiences in each garden. Teachers and therapists, however, thought that some negative experiences were important in terms of users' sensory, environmental and social learning.

3. Which zone do users' prefer in their sensory garden and do they reflect the features they use most often? The study investigated the use of features in order to find out users' preferences.

The highest number of users in both special schools was engaged with the grass, pathway, seating, animals and sound stimuli. This is because the layout of the pathway network that connects the garden to the site context is accessible. Although the pathway, sound stimuli, grass and animals had the highest number

of users, these features offered a shorter experience, where users who engaged with them had an immediate response. In contrast, the willow tunnel, raised beds, seating, trees and textured wall had the longest median time spend per user. Users chose to engage longer with these features because it afforded them various activities such as communicating (including sign language); sitting; bark rubbing; pulling the tree branch, plucking and feeling the leaf; and taking photos.

4. Based on the interviews, why do problems still exist in sensory gardens even though they are designed by trained designers? The study examined the design process undertaken by, and the intentions of, the designers and the constraints that they had to deal with.

In special education environments, it is particularly hard to generalise about design requirements, as schools tend to vary enormously in the range of special needs and ages that they cater for. Success may rely upon a close partnership between the designers, teachers and children (Stoneham, 1997; Farrer, 2008). While Stoneham and Farrer encourage teamwork, in the two case-study examples, the respective designers reported the following: Sue Robinson who designed the sensory garden of RSDCD, mentioned that there were a few minor designs she would change and she would wanted to have been involved at the detailed design and construction stage. Mark Boothroyd, who undertook the sensory garden project of the LS, believed that the path network had to be constructed first to provide access throughout the garden, closely followed

by planting, however, the planting had been carried out last.

The contribution of study: Subset of design recommendations

A combination of soft, hard landscape and landscape furniture placed adjacent to a continuous primary pathway that offered easy access to the functional features, recorded the highest preferences. The layout of the pathway network linking to the sensory garden to the overall site context is crucial in encouraging the number of users who will engage with the features placed along it. This finding echoed research undertaken by Moore and Cosco (2007), which showed that a highly positive feature and the most popular among the users was a wide pathway that gave access to the facilities that were accessible. Another of their findings was that a meandering pathway afforded inclusion and added visual interest to the pedestrian experience. This raised another question about the direct pathway at the RSDCD compared to the curvy one at the LS (see Plans 1 and 2). *Does the formation of a path play an important role in encouraging the richness of affordances and behaviour?* The study looked back at the overall design framework related to the path layout of both sensory gardens.

‘Sensory trail’. A sensory trail has similar objectives to the sensory garden in providing a range of experiences but it has more association with movement. It can, therefore, have a direct application to teaching orientation skills, for example through people learning to recognise

different sounds, textures and scents along the trail and gaining confidence in their own abilities to interpret the environment and find their own way. This is significant new knowledge, from a design point of view, indicating that pathway layout is more important than the particular design of features as long as the pathways are accessible. Most designers spend a considerable amount of time worrying about hidden away places that are supposed to offer wonderful experiences but which are not really being used.

Sensory value. As mentioned earlier, the teachers and therapists in both special schools had no strong views on aesthetic values in relation to the use of area in the sensory garden. In contrast, the designers disagreed with their views where they often talked about the beautification of the site. On the other hand, users of the sensory garden thought that the features should not just be aesthetically pleasant to see but also they should be nice to touch, hear, smell and taste. In other words, aesthetic value is not as important as sensory value. The fact that they can get access to and engage with them is the key point when designing for a sensory garden.

Conclusions

As the two case studies showed, the integration of sensory garden design into the overall design of special schools, and its inclusion in the curriculum, could encourage the creation of an outdoor environment which could offer a wide range of multi-sensory learning

experiences for children with special needs. Designers should recommend, firstly, that sensory garden design should be integrated into the overall planning phases of a special school's development. Secondly, they should recommend students' (and their carers') involvement in sensory garden design. Thirdly, designers should observe and record users' daily routines, to better understand the affordances the way they perceive them. Fourthly, designers should consider accessibility to, and the functionality of, the soft, hard landscapes and landscape furniture. With a continuous circulatory pathway network user enjoyment of, and engagement with, the features are likely to be enhanced; and the sensory trail is one very good way to achieve that.

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Footnotes

¹ A sensory garden is a self-contained area that concentrates a wide range of sensory experiences. Such an area, if designed well, provides a valuable resource for a wide range of uses, from education to recreation (http://www.sensorytrust.org.uk/information/factsheets/sensory_ip.html) [Assessed August 2009]

² The Sensory Trust was established in 1989 and grew out of a multi-disciplinary consultation resulting in a wide network of disability and environmental organisations working together to promote and implement an inclusive approach to design and manage outdoor spaces; richer connections between people and place; and equality of access for all people (<http://www.sensorytrust.org.uk>) [Assessed 2009]

³ A disabled person means an individual who has a physical or mental impairment that has a substantial and long-term adverse effect on his/her ability to carry out normal day-to-day activities (Disability Discrimination Act 1995).

⁴ Not all features will be assessed by loose-surface paths. The loose surface for some users, particularly for users in wheelchairs, is problematic if it is the only form of access. On the other hand, if the school is unlikely to have wheelchair users, the use of loose surfaces can be sensorily stimulating and pleasant to them.

⁵ Aesthetic, quoted by Hill (1995:170) as 'The philosophy or theory of taste, or the perception of the beautiful in nature and art'. In this study, the term 'aesthetic' will be used generally when describing the visual composition of the respective school sensory gardens.

⁶ Photographs were taken by the researcher in the sensory gardens but none include shots of the users due to the school policy.

⁷ *Vaporised trail* was the term used by the designer of the sensory garden. It was designed for wheelchair users to offer challenges, with a surface of gravel and limestone blocks.

⁸ PECS allows staff and students with autism and other communication difficulties to initiate communication. Further information on PECS can be obtained at <http://www.pecs.org.uk/general/what.htm> [Assessed August 2009]

⁹ Main activities were walking/passing through, walking fast, walking together, walking with wheelchair/cyclist/walk frame, running, stopping/standing, stop/stand and talking, sitting, sitting together, sitting and talking, playing with sensory equipment, laying down and singing.

¹⁰ Seated activity refers to users who sat either on seats or other features in the sensory garden, including wheelchair users. The analysis of seated activity was undertaken

to find out in which area the users spent most or least time sitting while engaging with the features and whether the seating provided in the zones were used as it had been intended or if users preferred to sit on other features of their choice.

- ¹¹ Actualised affordances of an environment are what the children encountered during their independent mobility, perception and engagement with the environmental features (Heft, 1988, 1999; Kyttä, 2002, 2003, 2004, 2006).
- ¹² Positive affordances relate to the children's movement and their perceptions of the environment, resulting in them offering satisfaction, finding it appealing and friendly (Heft, 1999; Kyttä, 2003).
- ¹³ Negative affordances induce feelings of avoidance, danger, escape and fear (Heft, 1999; Kyttä, 2003).
- ¹⁴ Landscape design terminology comprises 'Soft Landscape', 'Hard Landscape' and 'Landscape Furniture'. Soft landscape consists of planted areas, trees, shrubs, grass (Hill, 1995:317). Hard landscape consists of hard surfaces, structures, planters (Hill, 1995:241). Landscape furniture consists of seating, litter bins, lighting, signs, bollards, play structures, shelters (Hill, 1995:291).